On some Ovicells of Cyclostomatous Bryozoa.

By Arthur Wm. Waters, F.L.S., F.G.S.

[Read 5th April, 1888.]

(Plate XIV.)

For the determination of the Cyclostomatous Bryozoa the ovicells are certainly most important characters, and in many cases are undoubtedly of generic value; but how far this is universally the case we are not yet in a position to decide. It may, however, safely be said that the Cyclostomata will never be rescued from their present confusion until we are more fully acquainted with these receptacles. Though of such paramount importance, they are not known in a large majority of species. This is partly on account of insufficient search, but more from the fact that large numbers of specimens are often found without any ovicells; so that in some common species they are as yet unknown. For instance, *Hornera concatenata*, Reuss, a fossil found abundantly in the Miocene of Italy, Germany, Austria, and Hungary, has, so far as we know, never furnished an ovicell.

It will thus be seen that with the Cyclostomata it is often the case that abundant material is necessary for true appreciation of the characters, and therefore it was a considerable disappointment that the results of the 'Challenger' Expedition were not richer in this respect. I am, however, now able to add figures of the ovicells of three species found by the 'Challenger,' one from 'Challenger' material, and two from specimens in my own collection from other localities.

Hornera fissurata, *Busk*. (Pl. XIV. figs. 1, 3, 4, 7.)

Taking them in order: when, through the kindness of Mr. John Murray, I received two colonies of "*Idmonea fissurata*," Busk, from 'Challenger' "Station 320," near Monte Video, I was surprised to find a dorsal ovicell upon one, giving sufficient ground for removing it to *Hornera*; but the structure of both the front and back would have led me to do this independently of the ovicell.

As Miss Busk had kindly sorted and forwarded the specimens, I informed her what I had found; and she replied that she had also noticed them, and mounted some for the British Museum, and added that it was to be regretted that "there did not happen to be any among the rather numerous specimens selected for

examination by Mr. Busk"; who would have placed it, she considered, under *Hornera* if he had noticed the ovicell.

In *Idmonea* I believe the ovicell is only known in *I. radians*, Lam., *I. atlantica*, Forbes, *I. gracillima*, Busk, *I. concava**, Reuss, *I. serpens*, L., *I. eboracensis*, Busk, *I. radicata*, Kirkpatrick; and in all is on the anterior surface; but both in *Idmonea* and *Hornera* the position may be axillary, or far away from the bifurcation; and the position in relation to the axils can seldom or never be looked upon as characteristic. I have before me a MS. list of 130 *Idmoneæ*, some of them synonyms, though all have been considered as separate species; but only in the few cases mentioned is the ovicell described. An ovicell has been figured by Hagenow as *Cœlophyma granulata* on "*Idmonea*" *lichenoides*, Goldf.; but I am not sure that this is a true *Idmonea*.

From a list of 74 species of *Hornera*, it seems that the ovicell is only known in *H. frondiculata*, Lam., *H. foliacea*, MacG., *H. violacea*, Sars (practically dorsal), *H. galeata*, Sm., *H. robusta*, MacG., *H. ramosa*, MacG., *H. lichenoides*, L.† Goldstein (Trans. Roy. Soc. Vict. 1881, pl. ii. figs. 6, 7, 8) has named a 'Challenger' specimen from Marion Island *H. subdubia*, with "ovicells"; but from the figure it might be *Hydrocorallina*. Reuss has described as *Cœlophyma striata* an ovicell which, as pointed out by Manzoni, probably belongs to *H. hippolyta*, Defr. In all these cases the ovicell is dorsal, forming a distinct chamber; and this is also the case in *Hornera fissurata*. In this last it is longitudinally ridged, and in the furrows are pits, giving, when not calcined, an areolated appearance.

The position and nature of the opening of the ovicell is most important, often, in fact, more so than the shape of the ovicell. The opening is, however, formed after the ovicell is com-

* Not described; but a recent specimen from Naples has the ovicell as a raised chamber at the bifurcation. It nearly encloses one of the series, and the ovicellular opening is by the side of the series. In another specimen there is a slight central inflation between the series; but this does not seem to be mature.

† I find that *H. lichenoides*, L., occurs in Naples, together with *H. frondiculata*, and has an ovicell with a rib down the middle, as figured by Smitt and Alder, whereas Hincks figures a transverse rib. It has been looked upon as an exclusively northern form; but the 'Challenger' found it off Monte Video; and, as mentioned, it lives in the Mediterranean. Among the 'Challenger' material in Edinburgh I have since seen the ovicells on specimens from Simon's Bay. These have a central rib, and also a transverse one from the ovicelluiar opening to the median rib.

plete, so that frequently this important character cannot be made out; and in my specimen I could not find any opening, but one of the lateral zoœcial tubes is much larger than usual, and looked as though this change was connected with the functions of the ovicell. I therefore wrote to Mr. Kirkpatrick, of the British Museum, explaining what I had seen in my specimens, and asked him if he would look at those in the Museum. He kindly did so at once, and wrote that he examined ten ovicells, "and found in each instance that the last one or two zoœcia of a series in proximity to an ovicell are not only enlarged, but considerably altered in direction. In eight instances the tube curved forwards and upwards so as to open on the anterior surface." In two the tubes opened laterally. "In every case the wide tube is to some extent connate to a zoœcial series; but in some cases the former curves away from the latter in such a way as to make the wide tube appear to be part of the ovicell, and not a metamorphosed zoœcium" *.

I have already referred (Ann. Mag. Nat. Hist. ser. 5, vol. xx. p. 255) to the fact that the ovicells of the Cyclostomata have the surface nearly always perforated with much more numerous pores than the rest of the zoarium. In the present case the ridges are narrower and the pits somewhat finer than on the rest of the dorsal surface; and at the base of these pits, which are sometimes spoken of as pores, there are several fine pores, whereas in the pits on the dorsal surface, except when elongated, there is but one pore at the base. It will thus be seen that in this case the pores on the ovicell are much more numerous than on the rest of the zoarium.

Figures (1 and 3) are given from calcined specimens of the front and back of the zoarium, and I consider that preparations should be thus made wherever there is available material; for figuring with all the organic integument is like taking a photograph of a lady with a thick veil down. Calcined specimens can be directly compared with fossils.

The anterior surface has large pores, or rather pits, following the lines of the zoœcia, with one or two pores at the base of the pit. The way in which the ornamented appearance is formed is shown more clearly in this species than in any other I have seen. At

* In the 'Challenger' specimens in Edinburgh ovicells occur in a large number of cases, with a large lateral tube curving forwards.

the growing end the zoœcial tubes are more or less angular, and down each side there is a row of rather small pores (fig. 3); as growth proceeds, calcareous matter is added in ridges both on the front and back surfaces, and then these small pores are left at the bottom of the pits. I figured and referred to these pits in *Hornera frondiculata* in the Quart. Journ. Geol. Soc. vol. xl p. 677, pl. xxx. fig. 8.

The external structure of the growing ends of the outside is the same as seen in the inside in other parts when broken down, or when sections are made. The position of the interzoœcial pores is often very characteristic, and can also sometimes be used in fossil species. These internal pores may be in parallel rows close together or far apart, and may be approximately regular or irregular; and the distance apart is a point of great importance; but as yet little attention has been given to these pores in published papers. An absolute regularity does not seem ever to occur; but the plan can very frequently be seen.

There is one structure which I am not able to explain. In the interior of the zoœcial tubes there are several protuberances projecting forwards (fig. 7), either short or half as long as the width of the zoœcial tubes, and much curved forwards. They do not seem to be the commencements of "closures," and whether they are used for attachments cannot be decided from my dried specimens. Although I have sections of a very large number of Cyclostomata, I have not come across anything of the kind before. It does not seem likely that it should be compared with the rays of *Entalophora intricaria*, *Lichenopora*, and *Heteropora* (see Quart. Journ. Geol. Soc. vol. xliii. p. 340, &c.); but both are as yet unexplained. In the coarsely pitted structure this species resembles *Idmonea radians*, Lam.; but the genus *Idmonea* usually has a finely punctured surface.

The zoœcia are arranged in very distinct series, suggesting at first *Idmonea*; but the serial arrangement is not uncommon in *Hornera*; for in *H. lichenoides* it occurs decidedly in some specimens, and in the fossil *H. concatenata*, Rss., and *H. serrata*, Rss. (non d'Orb., non Menegh.), it is very marked; again in *H. lichenoides* the amount to which the zoœcial tubes are exserted is variable, and no doubt this and *H. fissurata* are closely allied.

Idmonea Meneghini, *Heller*. (Pl. XIV. fig. 2.)

The ovicell taking the place of one of the lateral series is a

unique structure; and, so far as I am aware, nothing of the kind has before been found. The base is narrow, but the sac widens out, and then again becomes narrower; the surface has a few large oval pores, and the ovicellular opening is a raised tube at one upper corner. The zoœcial tubes spread out at the ends.

It is placed, with hesitation, under *I. Meneghini*, as there are only four zoœcia to a series; but Heller only figures four, and the number is not always constant in a colony. In a specimen from Naples, without an ovicell, of what I considered *I. Meneghini*, the zoœcial tubes do not spread out at the end in the same way; but sometimes a trace of this structure can be seen. The dorsal surface near the ends of the branches is finely punctured, but near the base there are larger openings. I have only the one specimen with ovicells.

Idmonea irregularis, *Meneghini*. (Pl. XIV. figs. 5 and 6.)

This was found by the 'Challenger' off the Azores; and Mr. Busk (p. 14) says, "oœcial chamber?"

I have, however, previously (see Ann. Mag. Nat. Hist. ser. 5, vol. xx. p. 257, and Quart. Journ. Geol. Soc. vol. xl. p. 687) referred to the dorsal ovicell of *I. irregularis*; but as it has never been figured, a normal ovicell is given (fig. 5) and a short abnormal one (fig. 6).

The ovicellular aperture is wide, with a raised irregular funnel-shaped opening; but in the young ovicells the upper part is flat, sloping inwards. One colony has eight ovicells, and five of these are intact, without showing any opening; and from this we see how misleading this specimen alone would have been, as the young ovicells are without external orifices.

A somewhat similar ovicell occurs on *Filisparsa orakeiensis*, Stol. (*loc. cit.* p. 687).

Idmonea Milneana, *d'Orb.* (Pl. XIV. fig. 8.)

I have already referred to the ovicell of *I. Milneana* (Ann. Mag. Nat. Hist. ser. 5, vol. xx. p. 256), and give a figure from a Capri specimen, and may repeat that the British Museum specimens of *I. notomala*, B., and *I. Milneana*, d'Orb., are so similar that they might be fragments of the same colony. The ovicell is figured from a rather broken-down specimen, and therefore there is some restoration of the zoœcial tubes.

EXPLANATION OF PLATE XIV.

Fig. 1. Anterior surface of *Hornera fissurata*, Busk, drawn from calcined specimen.
2. *Idmonea Meneghini*, Heller. Naples.
3. Dorsal surface (growing end) of *Hornera fissurata*, B.
4. Dorsal surface of *Hornera fissurata*, B., showing ovicell.
5. Normal ovicell of *Filisparsa irregularis*, Meneghini. Dorsal surface. Naples.
6. Short ovicell of *Filisparsa irregularis*, Menegh.
7. Section of zoœcial tubes of *Hornera fissurata*, B., showing interior projections.
8. *Idmonea Milneana*, d'Orb., from Capri.

Note.—I also found that in *Gephyrophora polymorpha*, B., dredged by the 'Challenger' from Simons Bay, there is an entirely concealed ovicell. It is a round sac quite free except at the border of the opening; whereas in other Chilostomata, so far as my experience goes, the wall of the ovicell is for a considerable part attached to the zoœcial walls.

On the Ovicells of some *Lichenoporæ*.

By Arthur Wm. Waters, F.L.S., F.G.S.

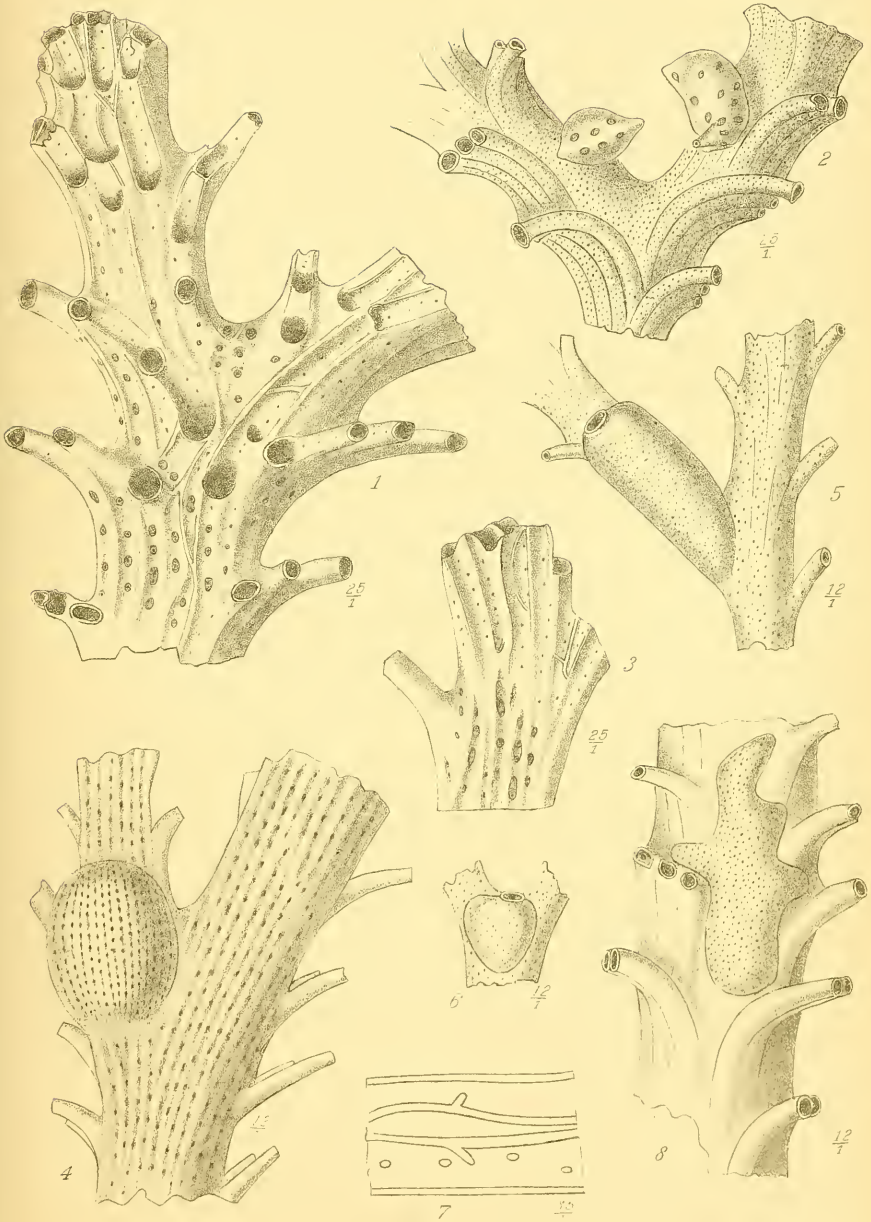
[Read 3rd May, 1888.]

(Plate XV.)

By *Lichenopora* I understand a genus with cancelli between the rays; but there are other discoid forms with the zoœcia arranged in radial series, so that the mode of growth is common to several genera. For instance, the fossil *Actinopora regularis*, d'Orb., does not seem to have any cancelli, and I cannot agree with my friend Mr. Hincks in placing it under *Lichenopora*, but should consider it *Multitubigera*.

Dr. Jullien * would take us back to the name *Disporella* of Gray, and points out the curious mistake that was made for so many years in calling this genus *Discoporella*, Gray; whereas *Discoporella* was a name given by d'Orbigny to some Chilostomata which would now be *Cupularia* or allied genera. The genus *Lichenopora* is, however, older than Gray's, and is now well established, so that I am unable to understand why Dr. Jullien wishes us to return to *Disporella*. On the other hand, another

* Mission du Cap Horn: Bryozoaires.



A.W.Waters del. Hollick lith.

Imp. Camb. Sci. Inst Co.

OVICELLS OF BRYOZOA